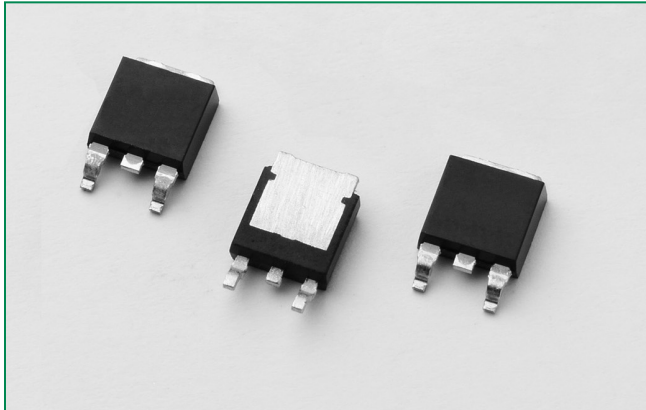


SRR6016xx Series

RoHS



Description

Excellent unidirectional switches for phase control and general switching applications such as heating, motor control controls, converters / rectifiers and capacitive discharge ignitions.

Standard phase control SCRs are triggered with few milliamperes of current at less than 1.5V potential.

Features & Benefits

- RoHS compliant
- Glass – passivated junctions
- Voltage capability up to 600 V
- Surge capability up to 160 A

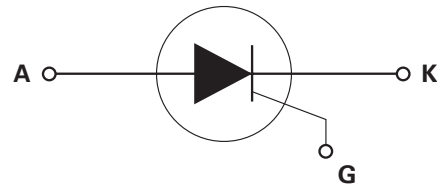
Applications

Typical applications includes capacitive discharge system for motorcycle engine CDI, portable generator engine ignition, strobe lights and nailers, as well as generic rectifiers, battery voltage regulators and converters. Also controls for power tools, home/brown good and white goods appliances.

Main Features

| Symbol | Value | Unit |
|-------------------|-------|------|
| $I_{T(RMS)}$ | 16 | A |
| V_{DRM}/V_{RRM} | 600 | V |
| I_{GT} | 6 | mA |

Schematic Symbol



Absolute Maximum Ratings – Standard SCRs

| Symbol | Parameter | Test Conditions | SRR6016x1 | Unit |
|--------------|---|--|------------|------------------------|
| $I_{T(RMS)}$ | RMS on-state current | $T_c = 100^\circ\text{C}$ | 16 | A |
| $I_{T(AV)}$ | Average on-state current | $T_c = 100^\circ\text{C}$ | 10.24 | A |
| I_{TSM} | Peak non-repetitive surge current | single half cycle; $f = 50\text{Hz}$; T_j (initial) = 25°C | 132 | A |
| | | single half cycle; $f = 60\text{Hz}$; T_j (initial) = 25°C | 160 | |
| I^2t | I^2t Value for fusing | $t_p = 8.3 \text{ ms}$ | 107 | A^2s |
| di/dt | Critical rate-of-rise of on-state current | $f = 60 \text{ Hz } T_j = 125^\circ\text{C}$ | 100 | $\text{A}/\mu\text{s}$ |
| I_{GM} | Peak gate current | $T_j = 125^\circ\text{C}$ | 2 | A |
| $P_{G(AV)}$ | Average gate power dissipation | $T_j = 125^\circ\text{C}$ | 0.5 | W |
| T_{stg} | Storage temperature range | | -40 to 150 | $^\circ\text{C}$ |
| T_j | Operating junction temperature range | | -40 to 125 | $^\circ\text{C}$ |

Electrical Characteristics ($T_J = 25^\circ\text{C}$, unless otherwise specified) – Standard SCRs

| Symbol | Test Conditions | | SRR6016x1 | Unit |
|----------|---|------|-----------|------------------|
| I_{GT} | $V_D = 12\text{V}$ $R_L = 60\ \Omega$ | MIN. | 1.5 | mA |
| | | MAX. | 6 | mA |
| V_{GT} | $V_D = 12\text{V}$ $R_L = 60\ \Omega$ | MAX. | 1.5 | V |
| dv/dt | $V_D = V_{DRM}$; gate open; $T_J = 100^\circ\text{C}$ | MIN. | 300 | V/ μs |
| | $V_D = V_{DRM}$; gate open; $T_J = 125^\circ\text{C}$ | | 225 | |
| V_{GD} | $V_D = V_{DRM}$; $R_L = 3.3\ \text{k}\Omega$; $T_J = 125^\circ\text{C}$ | MIN. | 0.2 | V |
| I_H | $I_T = 200\text{mA}$ (initial) | MAX. | 40 | mA |
| t_q | (1) | MAX. | 35 | μs |
| t_{gt} | $I_G = 2 \times I_{GT}$; $PW = 15\mu\text{s}$; $I_T = 20\text{A}$ | TYP. | 2 | μs |

NOTE: (1) $I_T=2\text{A}$; $t_p=50\mu\text{s}$; $dv/dt=5\text{V}/\mu\text{s}$; $di/dt=-30\text{A}/\mu\text{s}$

Static Characteristics

| Symbol | Test Conditions | | Value | Unit |
|---------------------|---|---------------------------|-------|---------------|
| V_{TM} | $I_T = 32\text{A}$; $t_p = 380\ \mu\text{s}$ | MAX. | 1.8 | V |
| I_{DRM} / I_{RRM} | V_{DRM} / V_{RRM} | $T_J = 25^\circ\text{C}$ | 10 | μA |
| | | $T_J = 110^\circ\text{C}$ | 500 | |
| | | $T_J = 125^\circ\text{C}$ | 1000 | |

Thermal Resistances

| Symbol | Parameter | Value | Unit |
|-------------------|-----------------------|-------|---------------------------|
| $R_{\theta(J-C)}$ | Junction to case (AC) | 1.50 | $^\circ\text{C}/\text{W}$ |

Figure 1: Normalized DC Gate Trigger Current vs. Junction Temperature

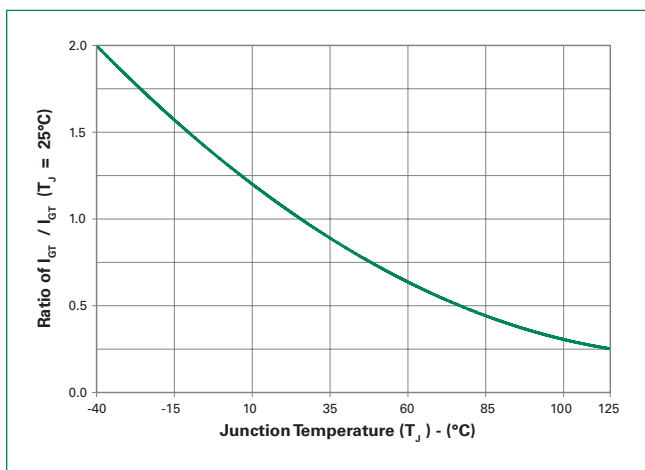


Figure 2: Normalized DC Gate Trigger Voltage vs. Junction Temperature

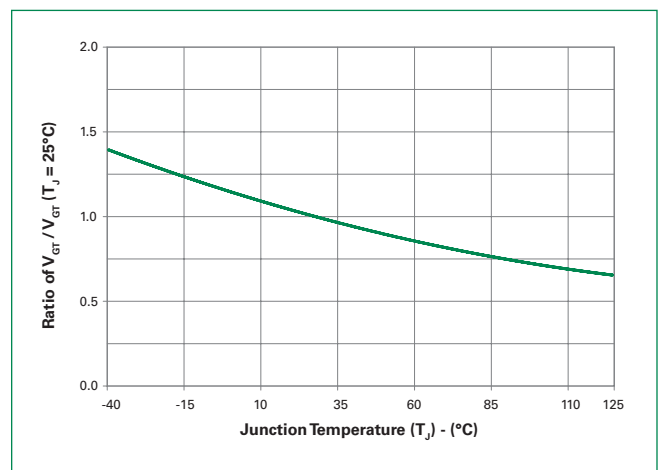


Figure 3: Normalized DC Holding Current vs. Junction Temperature

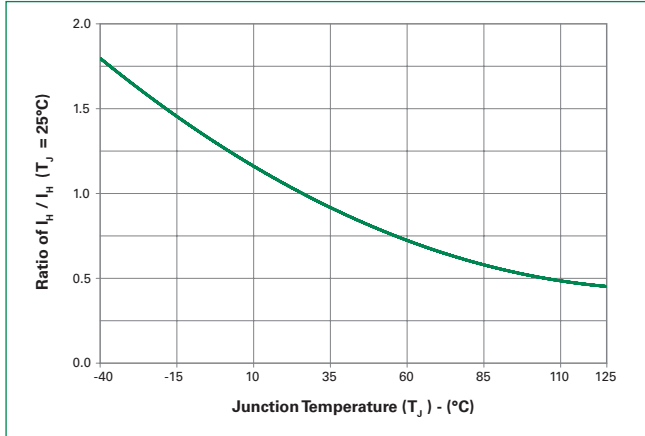


Figure 4: On-State Current vs. On-State Voltage (Typical)

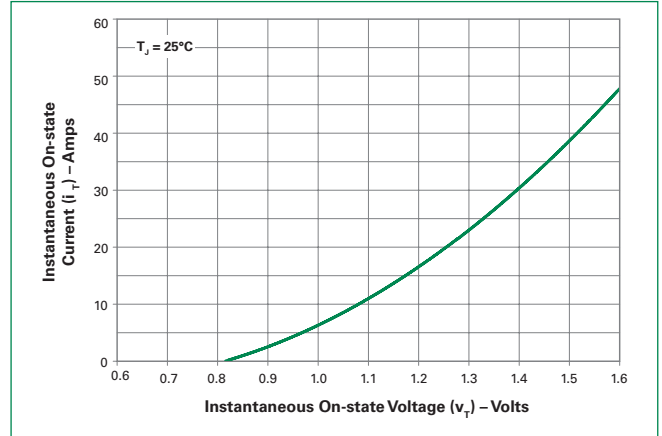


Figure 5: Power Dissipation (Typical) vs. RMS On-State Current

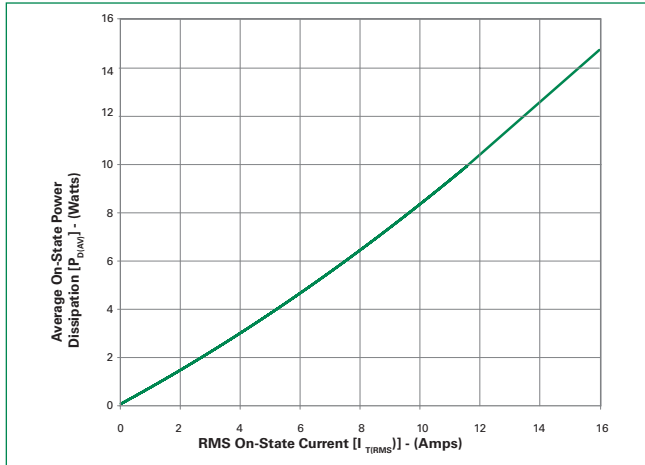


Figure 6: Maximum Allowable Case Temperature vs. RMS On-State Current

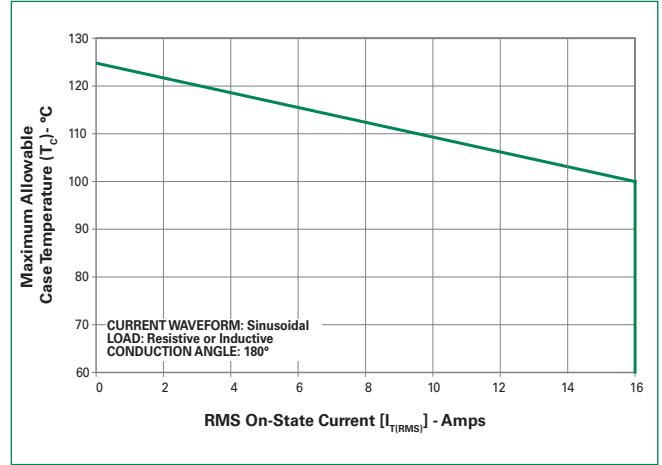


Figure 7: Maximum Allowable Case Temperature vs. Average On-State Current

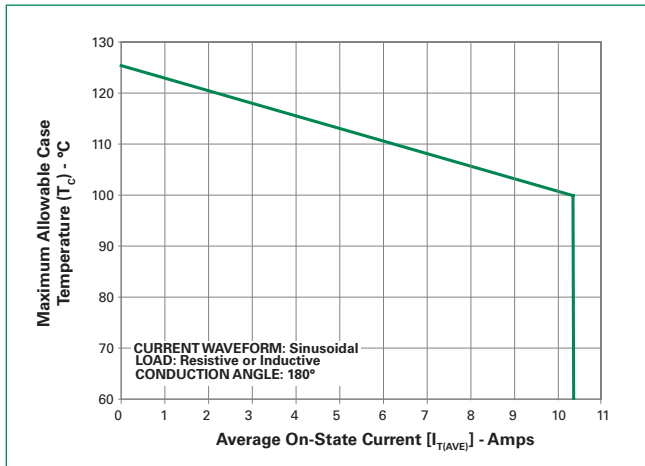


Figure 8: Peak Capacitor Discharge Current

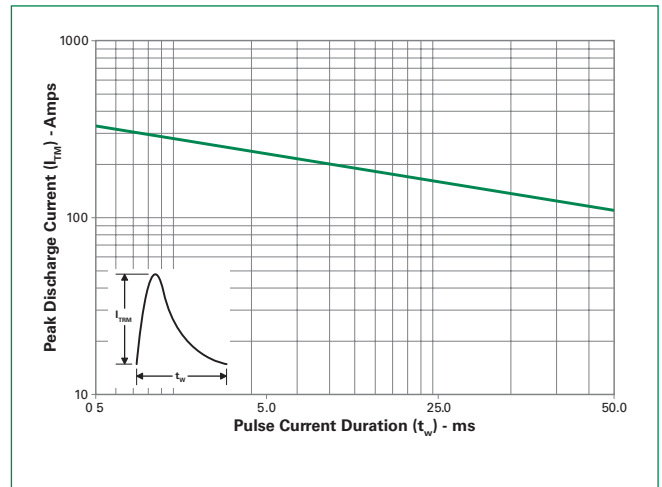


Figure 9: Peak Capacitor Discharge Current Derating

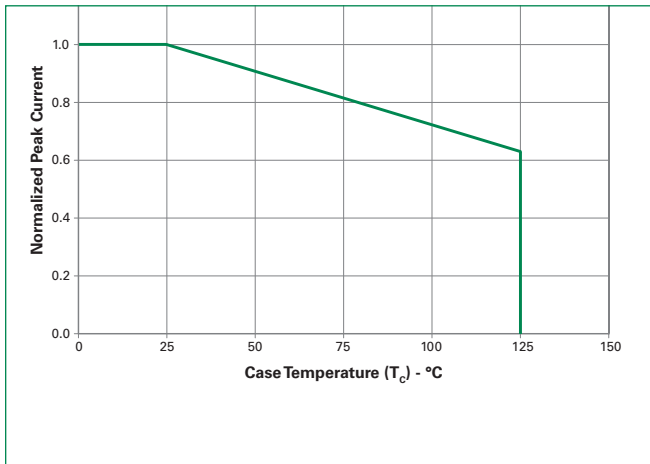
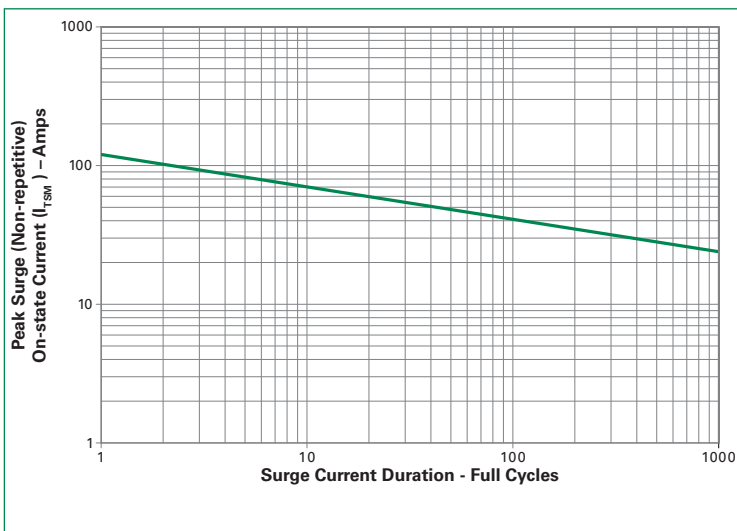


Figure 10: Surge Peak On-State Current vs. Number of Cycles

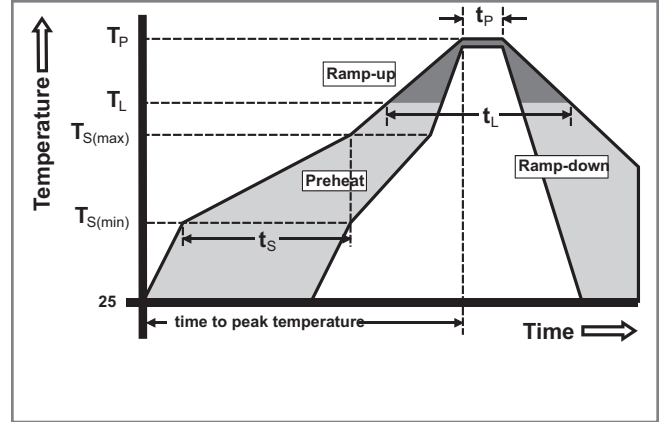


SUPPLY FREQUENCY: 60 Hz Sinusoidal
 LOAD: Resistive
 RMS On-State Current: [$I_{T(RMS)}$]: Maximum Rated Value at Specified Case Temperature

- Notes:
1. Gate control may be lost during and immediately following surge current interval.
 2. Overload may not be repeated until junction temperature has returned to steady-state rated value.

Soldering Parameters

| | | |
|--|------------------------------------|-------------------------|
| Reflow Condition | | Pb – Free assembly |
| Pre Heat | - Temperature Min ($T_{s(min)}$) | 150°C |
| | - Temperature Max ($T_{s(max)}$) | 200°C |
| | - Time (min to max) (t_s) | 60 – 180 secs |
| Average ramp up rate (Liquidus Temp) (T_L) to peak | | 5°C/second max |
| $T_{s(max)}$ to T_L - Ramp-up Rate | | 5°C/second max |
| Reflow | - Temperature (T_L) (Liquidus) | 217°C |
| | - Temperature (t_l) | 60 – 150 seconds |
| Peak Temperature (T_p) | | 260 ^{+0/-5} °C |
| Time within 5°C of actual peak Temperature (t_p) | | 20 – 40 seconds |
| Ramp-down Rate | | 5°C/second max |
| Time 25°C to peak Temperature (T_p) | | 8 minutes Max. |
| Do not exceed | | 280°C |



Physical Specifications

| | |
|------------------------|---|
| Terminal Finish | 100% Matte Tin-plated |
| Body Material | UL recognized epoxy meeting flammability classification V-0 |
| Lead Material | Copper Alloy |

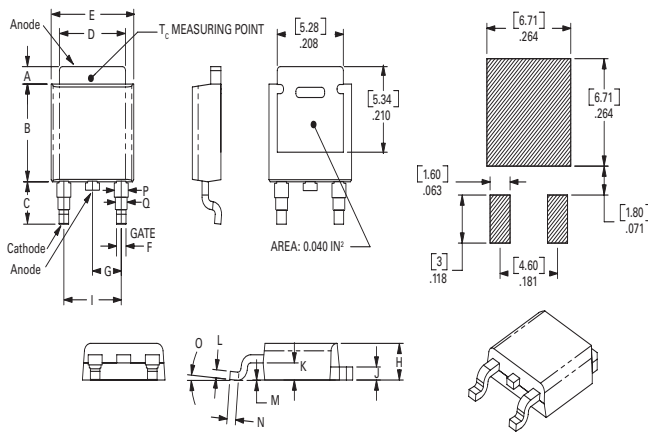
Design Considerations

Careful selection of the correct device for the application's operating parameters and environment will go a long way toward extending the operating life of the Thyristor. Good design practice should limit the maximum continuous current through the main terminals to 75% of the device rating. Other ways to ensure long life for a power discrete semiconductor are proper heat sinking and selection of voltage ratings for worst case conditions. Overheating, overvoltage (including dv/dt), and surge currents are the main killers of semiconductors. Correct mounting, soldering, and forming of the leads also help protect against component damage.

Environmental Specifications

| Test | Specifications and Conditions |
|----------------------------------|--|
| AC Blocking | MIL-STD-750, M-1040, Cond A Applied Peak AC voltage @ 125°C for 1008 hours |
| Temperature Cycling | MIL-STD-750, M-1051, 100 cycles; -40°C to +150°C; 15-min dwell-time |
| Temperature/Humidity | EIA / JEDEC, JESD22-A101 1008 hours; 320V - DC: 85°C; 85% rel humidity |
| High Temp Storage | MIL-STD-750, M-1031, 1008 hours; 150°C |
| Low-Temp Storage | 1008 hours; -40°C |
| Resistance to Solder Heat | MIL-STD-750 Method 2031 |
| Solderability | ANSI/J-STD-002, category 3, Test A |
| Lead Bend | MIL-STD-750, M-2036 Cond E |

Dimensions — TO-252AA (D-Package) — D-PAK Surface Mount

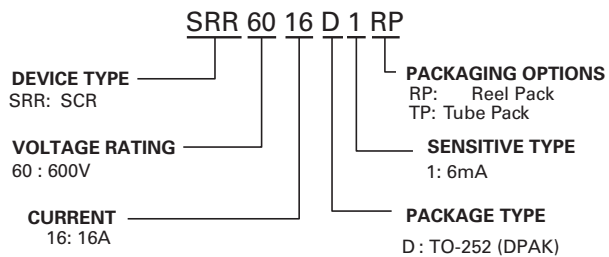


| Dimension | Inches | | | Millimeters | | |
|-----------|--------|-------|-------|-------------|------|------|
| | Min | Typ | Max | Min | Typ | Max |
| A | 0.040 | 0.043 | 0.050 | 1.02 | 1.09 | 1.27 |
| B | 0.235 | 0.243 | 0.245 | 5.97 | 6.16 | 6.22 |
| C | 0.106 | 0.108 | 0.113 | 2.69 | 2.74 | 2.87 |
| D | 0.205 | 0.208 | 0.213 | 5.21 | 5.29 | 5.41 |
| E | 0.255 | 0.262 | 0.265 | 6.48 | 6.65 | 6.73 |
| F | 0.027 | 0.031 | 0.033 | 0.69 | 0.80 | 0.84 |
| G | 0.087 | 0.090 | 0.093 | 2.21 | 2.28 | 2.36 |
| H | 0.085 | 0.092 | 0.095 | 2.16 | 2.33 | 2.41 |
| I | 0.176 | 0.179 | 0.184 | 4.47 | 4.55 | 4.67 |
| J | 0.018 | 0.020 | 0.023 | 0.46 | 0.51 | 0.58 |
| K | 0.038 | 0.040 | 0.044 | 0.97 | 1.02 | 1.12 |
| L | 0.018 | 0.020 | 0.023 | 0.46 | 0.51 | 0.58 |
| M | 0.000 | 0.000 | 0.004 | 0.00 | 0.00 | 0.10 |
| N | 0.021 | 0.026 | 0.027 | 0.53 | 0.67 | 0.69 |
| O | 0° | 0° | 5° | 0° | 0° | 5° |
| P | 0.042 | 0.047 | 0.052 | 1.06 | 1.20 | 1.32 |
| Q | 0.034 | 0.039 | 0.044 | 0.86 | 1.00 | 1.11 |

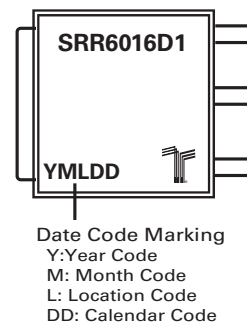
Packing Options

| Part Number | Marking | Weight | Packing Mode | Base Quantity |
|-------------|-----------|--------|------------------|-------------------|
| SRR6016D1TP | SRR6016D1 | 0.3 g | Tube | 750 (75 per tube) |
| SRR6016D1RP | SRR6016D1 | 0.3 g | Embossed Carrier | 2500 |

Part Numbering System



Part Marking System



TO-252 Embossed Carrier Reel Pack (RP) Specifications

Meets all EIA-481-2 Standards

